Amendments to the Claims

Please cancel claims 1-46 and add new claims 47-73 as follows.

Please enter the following Preliminary Amendment before beginning examination of the above-identified patent application.

47. (New) A plasma source comprising:

a) a cathode assembly comprising an inner cathode section and an outer cathode section;

b) a first anode that is positioned adjacent to the outer cathode section and forming a gap there between; and

c) a power supply that generates a first electric field across the gap between the first anode and the outer cathode section and that generates a second electric field between the inner cathode section and a second anode, the first electric field ionizing a volume of feed gas that is located in the gap, thereby generating an initial plasma, the second electric field super-ionizing the initial plasma to generate a plasma comprising a higher density of ions than the initial plasma.

48. (New) The plasma source of claim 47 wherein the first and the second anodes comprise a single anode.

49. (New) The plasma source of claim 47 wherein the power supply is chosen from the group comprising a pulsed DC power supply, an AC power supply, a DC power supply, and a RF power supply.

50. (New) The plasma source of claim 47 wherein the power supply further generates a third electric field across the gap between the first anode and the

outer cathode section, the third electric field super-ionizing the initial plasma that is located in the gap.

51. (New) The plasma source of claim 47 wherein at least one of the first and the second electric fields is chosen from the group comprising a static electric field, a pulsed electric field, and a quasi-static electric field.

52. (New) The plasma source of claim 47 wherein the initial plasma comprises a weakly-ionized plasma.

53. (New) The plasma source of claim 47 wherein the plasma comprising the higher density of ions than the initial plasma comprises a strongly-ionized plasma.

54. (New) The plasma source of claim 47 wherein the second electric field generates excited atoms in the initial plasma and generates secondary electrons from the inner cathode section, the secondary electrons ionizing the excited atoms, thereby creating a plasma comprising a higher density of ions than the initial plasma.

55. (New) The plasma source of claim 47 further comprising a gas valve that opens to exchange the initial plasma with a second volume of feed gas as the power supply generates the first electric field across the second volume of feed gas, thereby increasing an ion density of the plasma.

56. (New) The plasma source of claim 47 wherein the power supply generates at least one of the first and the second electric fields with a constant power.

57. (New) The plasma source of claim 47 wherein the power supply generates at least one of the first and the second electric fields with a constant voltage.

58. (New) The plasma source of claim 47 further comprising a magnet assembly that is positioned to generate a magnetic field proximate to at least one of the inner and the outer cathode sections, the magnetic field trapping electrons in at least one of the initial plasma and the plasma comprising the higher density of ions than the initial plasma.

59. (New) A plasma source comprising:

a) a cathode assembly comprising an inner cathode section;

b) an excited atom source that is positioned adjacent to the inner cathode section, the excited atom source generating an initial plasma comprising excited atoms from a volume of feed gas; and

c) a power supply that generates an electric field between the inner cathode section and an anode, the electric field super-ionizing the initial plasma to generate a plasma comprising a higher density of ions than the initial plasma.

60. (New) The plasma source of claim 59 wherein the excited atom source comprises a metastable atom source that generates metastable atoms from the volume of feed gas.

61. (New) The plasma source of claim 59 wherein the initial plasma comprises a weakly-ionized plasma.

62. (New) The plasma source of claim 59 wherein the plasma comprising the higher density of ions than the initial plasma comprises a strongly-ionized plasma.

63. (New) The plasma source of claim 59 further comprising a gas valve that injects feed gas directly between the inner cathode section and the anode.

64. (New) The plasma source of claim 59 wherein the power supply generates the electric field with a constant power.

65. (New) The plasma source of claim 59 wherein the power supply generates the electric field with a constant voltage.

66. (New) The plasma source of claim 59 further comprising a magnet assembly that is positioned to generate a magnetic field proximate to at least one of the inner cathode section and the excited atom source, the magnetic field trapping electrons in at least one of the initial plasma and the plasma comprising the higher density of ions than the initial plasma.

67. (New) The plasma source of claim 59 wherein the inner cathode section comprises target material for sputtering.

68. (New) A method of generating a high-density plasma, the method comprising:

a) generating a first electric field across a gap between a first anode and an outer cathode section, the first electric field ionizing a volume of feed gas that is located in the gap, thereby generating an initial plasma in the gap; and

b) generating a second electric field between a second anode and an inner cathode section, the second electric field super-ionizing the initial plasma, thereby generating a plasma comprising a higher density of ions than the initial plasma.

69. (New) The method of claim 68 wherein the generating the second electric field between the second anode and the inner cathode section generates excited atoms in the initial plasma and generates secondary electrons from the inner cathode section, the secondary electrons ionizing the excited atoms,

thereby creating the plasma comprising the higher density of ions than the initial plasma.

70. (New) The method of claim 68 wherein at least one of the first and the second electric fields is chosen from the group comprising a static electric field, a quasi-static electric field, and a pulsed electric field.

71. (New) The method of claim 68 further comprising generating a magnetic field proximate to at least one of the inner and outer cathode sections, the magnetic field trapping electrons in at least one of the initial plasma and the plasma comprising the higher density of ions than the initial plasma.

72. (New) The method of claim 71 wherein the magnetic field comprises magnetic field lines that are substantially parallel to at least one of the inner and the outer cathode sections.

73. (New) The method of claim 68 wherein the presence of the initial plasma reduces a probability of developing an electrical breakdown condition between the second anode and the inner cathode section after the second electric field is generated.